IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Application No.:	**10/729,044**
Applicants:	**Albert et al.**
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Filed:	**December 5, 2003**
Group Art Unit:	**2629**
Examiner:	**LEWIS, David Lee**
Attorney Docket No.:	**INK-029C1**
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Cambridge, Massachusetts
July 23, 2007

APPEAL BRIEF

Mail Stop Appeal Brief - Patents
Commissioner for Patents
P.O. Box 1450
Alexandria VA 22313-1450

Sir:

This is an appeal from the final rejection of all claims of the above application as set forth in the Office Action mailed October 31, 2006.

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REAL PARTY IN INTEREST

The real party in interest in this appeal is E Ink Corporation, the assignee of record, a corporation organized and existing under the laws of the State of Delaware, of 733 Concord Avenue, Cambridge, MA 02138-1002.

RELATED APPEALS AND INTERFERENCES

There are no related appeals and interferences.

STATUS OF CLAIMS

Claims 9-22 are pending in this application, claims 21 and 22 having been added in the Amendment filed August 9, 2006. (It is respectfully noted that although the first page of the final Office Action states the pending claims are claims 9-20, page 7 of the same action explicitly rejects claims 21 and 22.) All claims stand finally rejected; no claim is objected to. A copy of the pending claims appears in the Claims Appendix to this Brief.

STATUS OF AMENDMENTS

All Amendments filed during prosecution of this application have been entered.

SUMMARY OF CLAIMED SUBJECT MATTER

Claim 9 is directed to an electrostatically addressable display of the type illustrated in Figure 16, and described in the paragraph bridging pages 26 and 27 of the specification. This display comprises a substrate 306 and an encapsulated display medium 304 disposed adjacent the substrate 306. The encapsulated display medium comprises a plurality of cavities disposed in a polymeric matrix, at least one of the plurality of cavities containing an electrophoretic contrast media phase that includes at least one particle and a suspending fluid; see page 3, line 24 to page 4, line 18 for a general discussion of encapsulated display media, particles and polymeric matrices. The applicants do not claim that the encapsulated display medium used in the present display is itself novel. Finally, the display of claim 9 comprises a movable electrode (300 in Figure 16) such that application of electrostatic charge by the movable electrode to the display medium modulates an optical property of the display medium. The display may optionally comprise a dielectric layer 302 between the stylus 300 and the display medium 304.

Claim 10 is directed to a display according to claim 9 wherein the substrate comprises a clear conductive coating, as mentioned in the sentence bridging pages 26 and 27 of the specification. This clear conductive coating acts as a second electrode of the display.

Claim 17, the only other independent claim in this application, essentially relates to a method of addressing the display of claim 9. Claim 17 is directed to a method of addressing an electrostatically addressable display, this method comprising providing a display comprising a substrate 306, an electrophoretic display medium 304 (defined in the same way as in claim 9) and a movable electrode 300 and applying an electrostatic charge from the movable electrode 300 to the display medium 304 to modulate an optical property of the display medium 304.

Claims 21 and 22 are directed respectively to a display of claim 9 or a method of claim 17 wherein no capsule membrane is present between the electrophoretic contrast media and the polymeric matrix; this type of "polymer-dispersed electrophoretic medium" is discussed at page 4, lines 13-18 of the specification.

GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL

Claims 9-20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sheridon (U.S. Patent No. 5,389,945) (hereinafter called "Sheridon (945)"), Sheridon (U.S. Patent No. 4,126,854) (hereinafter called "Sheridon (854)") incorporated by reference in view of Naoyuki (Japanese Published Application No. 01-086116).

The rejection was set out in the final Office Action as follows:

As in claims 9 and 17, Sheridon (945) teaches of an electrostatically addressable display, **figure 8, column 2 lines 1-20**,

comprising: (a) a substrate, **figure 8 item 28**;

(b) an display medium disposed adjacent to said substrate, said display medium comprising a plurality of cavities dispersed in a polymeric matrix, **figure 8 item 26,**

wherein at least one of said plurality of cavities contains an electrophoretic contact media phase that includes at least one particle and a suspending fluid; **figure 3 item 37**

and (c) a movable electrode, wherein application of electrostatic charge by said movable electrode to said display medium modulates an optical property of said display medium, **column 2 lines 1-20, figure 2 item 30, figure 8 item 80, figure 9 item 86**

However Sheridon (945) is silent as to said display being an electrophoretic display.

Sheridon (854) teaches encapsulated spheres 14 are an improved alternative to electrophoretic particle migrating displays because the electrophoretic displays have the problem of particles sticking to the electrodes and particles clumping together over a period of time. Sheridon also teaches magnetic particle displays have been introduced as an alternative in order to overcome the size limitations and power requirements of other displays as a display alternative. However the requirements of the magnetic field present its own problems. Sheridon implies the electrophoretic display would be a useful alternative to the twisting ball display if its problems could be solved.

Naoyuki teaches the problem provided by the electrophoretic particle migrating display can be solved by encapsulating the particles into microcapsules, giving Sheridon another

viable display alternative, see the abstract. Because Naoyuki teaches of a known alternative to the twisting ball display of Sheridon and the problem noticed by Sheridon is solved by Naoyuki, it would have been an obvious design choice to the skilled artisan at the time of the invention to take advantage of the display employing the migration of color pigment particles to form an image on a matrix addressable panel, because said color features are useful for showing contrast on displays. Further wherein Naoyuki teaches of a plurality of microencapsulated particles dispersed in a fluid, said microcapsules being equivalent to the plurality of cavities dispersed in a polymeric matrix as claimed, and being substituted for the twisting balls of Sheridon.

Therefore it would have been obvious to the skilled artisan at the time of the invention to use and alternative to the twisting ball addressing device of Sheridon, by adapting the microencapsulated display of Naoyuki, into the twisting ball device of Sheridon, because such an electrophoretic particle migrating display has known color contrast advantages useful for display purposes as known in the art and suggested by Sheridon (854), as found in claim 9. Naoyuki provides the motivation to use the electrophoretic as a design alternative to the twisting ball display by solving the problem notice by Sheridon (854).

As in claim 10, Sheridon (945) teaches of wherein said substrate further comprises a clear conductive coating, column 2 lines 1-6, figure 3 item 54, column 4 lines 65-67, wherein the a thin conductive layers deposited is on the ground plane, Sheridon (854), figure 5 item 12 and 40.

As in claim 11, Sheridon (945) teaches of wherein said clear conductive coating comprises an ITO-coated polyester, column 4 lines 55-67, wherein said thin electrodes are made of ITO as known in the art.

As in claim 12, Sheridon (945) teaches of wherein the clear conductive coating is connected to ground potential, figure 3 item 54, column 4 lines 65-67, wherein the a thin conductive layers deposited is on the ground plane.

As in claim 13, Sheridon (945) teaches of further comprising a dielectric sheet disposed adjacent said display medium, column 3 lines 54-67, Sheridon (854), column 1 lines 5-15, column 4 lines 35-45, wherein the dielectric sheet is disposed next to the contrast medium.

As in claim 14, Sheridon (945) teaches of wherein said dielectric sheet further comprises a coating having low conductivity, column 3 lines 54-67, Sheridon (854), column 1 lines 5-15, column 4 lines 35-45, wherein the dielectric sheet is disposed next to the contrast medium.

As in claim 15, Sheridon (945) teaches of wherein said substrate further comprises an opaque conductive coating, column 6 lines 5-23.

As in claim 16, Sheridon (945) teaches of wherein said movable electrode comprises a stylus, figure 8 item 80, column 6 lines 4-23.

As in claim 18, Sheridon (945) teaches of further comprising the step of scanning said movable electrode over said display medium, column 3 lines 25-45, column 6 lines 15-23.

As in claim 19, Sheridon (945) teaches of wherein the step of scanning said movable electrode over said display medium is performed substantially contemporaneously with the step of applying an electrostatic charge from said movable electrode to said display medium, column 2 lines 1-20, column 3 lines 25-45, column 6 lines 15-23.

As in claim 20, Sheridon (945) teaches of wherein the step of scanning said movable electrode over said display medium and the step of applying an electrostatic charge atom said movable electrode to said display medium are performed sequentially, column 2 lines 1-20, column 3 lines 25-45, column 6 lines 15-23.

As in claims 21 and 22, Sheridon in view of Naoyuki fails to explicitly teach of wherein no capsule membrane is present between said electrophoretic contrast media phase and said polymeric matrix, however said feature would have been an obvious design choice, in view of Naoyuki, given the skilled artisan could obviously provide a single

electrophoretic cavity instead of a plurality cavities given the display size and contrast needs. Where a small display including a single electrophoretic cavity would encompass the entire electrophoretic contrast media phase and said polymeric matrix, and therefore no capsule membranes would be present between said electrophoretic contrast media phase and said polymeric matrix, as found in claims 21 and 22.

In response to arguments similar to those set forth below presented in the response to an earlier non-final Office Action, the final Office Action responded as follows:

Applicant's arguments filed 8/9/2006 have been fully considered but they are not persuasive. **Applicant argues** that Naoyuki does not teach that an electrophoretic medium can overcome all the problems which cause Sheridon to recommend against the use of electrophoretic media, hence Sheridon teaches away form using electrophoretic display media. The Examiner disagrees. As long as "one" of the problems encountered by Sheridon is solved by Naoyuki, said improvement is sufficient motivation for the modification of Sheridon in view of Naoyuki. As noted by the Applicant on page 6 of the response filed on 8/9/2006, Naoyuki solves three of the problems encountered by Sheridon, giving two additional reasons for the combination of Sheridon and Naoyuki. **Applicant argues** there is no suggestion in Sheridon that such a conductive coating be clear. The Examiner disagrees. Sheridon teaches that said layer is light transparent and therefore it reads on being clear because clear is equivalent/synonymous to transparent. New claims 21 and 22 would have been an obvious design choice in view Naoyuki providing a single electrophoretic cavity making up the entire display medium, excluding the need for a plurality of cavities based on the design choice of providing a small sized display.

ARGUMENT

Summary

Sheridon (945) and Sheridon (854), read together, teach a display (and a method for addressing such a display) which is generally similar to the display of the present invention in that it comprises a substrate, an electro-optic medium and a stylus which can be used to write on the electro-optic medium. However, the Sheridon display uses a completely different type of electro-optic medium, namely a rotating bichromal ball medium. Furthermore, Sheridon (854) sets out a detailed explanation as to why a rotating bichromal ball medium is to be preferred over an electrophoretic medium. Naoyuki teaches an encapsulated electrophoretic medium which overcomes some, but not all, of the disadvantages of earlier electrophoretic media, of the type discussed in Sheridon (854). However, the teaching in Naoyuki that encapsulation can overcome some of the disadvantages of earlier electrophoretic media would not be sufficient to persuade the skilled person to substitute the Naoyuki medium in the Sheridon (945) display, given the explicit teaching in Sheridon (854) that electrophoretic media possess other disadvantages which are not overcome by encapsulation.

Detailed argument

Summary of references

Sheridon (945) describes (see especially Figures 3 and 8) a display in the form of a writing tablet. As best seen in Figure 3, this display comprises a backing member or substrate 28 (see column 3, line 27 of this reference), a rotating bichromal ball medium 34 (see column 3, line 54 to column 4, line 13) and a housing 40, the exact details of which are irrelevant for present purposes. As shown in Figure 8, the tablet is provided with a stylus 80 which is electrically operated and capable of writing on the medium 34 (see column 6, lines 4-23), i.e., in the language of present claim 9, capable of modulating an optical property of the medium 34.

Sheridon (945) refers its readers to Sheridon (854) for details of the rotating bichromal ball medium 34; see especially column 3, lines 61-62 of Sheridon (945). Sheridon (854) does describe the rotating bichromal ball medium in great detail. However, Sheridon (854) also describes in detail reasons why a rotating bichromal ball medium is superior to an electrophoretic medium. For example, column 1, lines 1-39 of Sheridon (854) state:

> Flat display panel devices continues to receive much attention since they provide distinct advantages over conventional cathode ray tubes which are now the standard visual display device. U.S. Pat. No. 3,612,758, sets forth those advantages and discloses a flat display panel employing migration of color pigment particles of form an image on a matrix addressable panel. Specifically, the patented display utilizes a suspension of colored particles maintained in a thin layer of dyed dielectric liquid, enclosed between two electrodes, one of which is transparent. Upon the application of a D.C. voltage of suitable polarity between the electrodes, colored particles will move through the liquid toward the transparent electrode and deposit on it. The liquid is dyed a contrasting color to the colored particles such that only when the particles are deposited on, or in very close proximity to, the transparent electrode will the particles be visible. Otherwise, the color of the display as viewed through the transparent electrode will be that of the dyed dielectric liquid.
>
> The flat panel display of U.S. Pat. No. 3,612,758 has several problems associated therewith which are difficult to solve. One problem relates to the usage of a dyed liquid; the dye tends to be absorbed on the colored particles and the transparent electrode, diminishing the contrast and appearance of the display. Particle settling over a period of time (due to gravity), particle agglomeration and clumping together over a period of

> time, and particle adherence to the transparent electrode pose additional problems. Another problem is that the particles must move substantial distances during display operation, thereby causing the display to operate with relative slowness. Also, because D.C. fields are used, it is probable that electro-chemical changes will take place in the display over extended periods of time.
>
> Column 2, lines 48-54 of Sheridon (854) state:
>
> Since the particles *[i.e., the rotating balls]* need only rotate, not translate, to provide an image, much faster imaging response is achieved than with the display of U.S. Pat. No. 3,612,758. Also, the display can be addressed electrostatically which provides increased discrimination relative to displays using magnetic addressing or switching (Italicized explanatory phrase added).

Naoyuki describes an encapsulated electrophoretic medium of the type preferred for use in the present electrophoretic display. Naoyuki teaches that unencapsulated electrophoretic are known but coagulation of the electrophoretic particles and adhesion phenomena may cause unevenness in such displays (see the Naoyuki translation filed with the Amendment of August 9, 2006, page 2, last complete paragraph, lines 4-6). Accordingly, it is known to provide mesh-shaped spacers with numerous holes, which divide the electrophoretic medium into discontinuous areas and thereby stabilize display operation (see the last five lines of the same paragraph). However, it is extremely difficult to uniformly fill the numerous holes in such spacers (see the paragraph bridging pages 2 and 3 of the translation). Accordingly, Naoyuki proposes that the electrophoretic particles and the dispersion medium be formed into numerous microcapsules which are then placed between the electrodes to form the electrophoretic medium (see page 3 of the translation, second complete paragraph). The "Effects of the Invention" section on page 4 of the translation claims the following advantages for such encapsulated media:

(i) coagulation of the electrophoretic particles or adhesion to the electrodes is eliminated, resulting in uniform and stable display operation; (ii) handling of the disperse system and filling the space between the electrodes are improved; and (iii) it is possible to produce disperse systems with various display colors by arranging microcapsules with different display colors.

Patentability of claims 9 and 11-20

Contrary to the final rejection, a person of ordinary skill in the relevant art would not substitute the Naoyuki encapsulated electrophoretic medium for the rotating bichromal ball medium of Sheridon (945) given the Sheridon (854) teaches that electrophoretic media have numerous disadvantages compared to rotating bichromal ball media, and that Naoyuki does not suggest that all these disadvantages can be overcome by encapsulating the electrophoretic media.

Assuming *arguendo* that the skilled person would read Sheridon I, Sheridon II and Naoyuki together, it is noted that Sheridon (854) lists several discrete disadvantages of electrophoretic media:

(a) use of a dyed liquid; the dye tends to be absorbed on (i) the colored particles and (ii) the transparent electrode, diminishing the contrast and appearance of the display (Sheridon (854), column 1, lines 27-30);

(b) particle settling over a period of time due to gravity (Sheridon (854), column 1, lines 30-31);

(c) particle agglomeration and clumping together over a period of time, and particle adherence to the transparent electrode (Sheridon (854), column 1, lines 31-33);

(d) the particles must move substantial distances during display operation, thereby causing the display to operate with relative slowness (Sheridon (854), column 1, lines 34-37); and

(e) because D.C. fields are used, it is probable that electro-chemical changes will take place in the display over extended periods of time (Sheridon (854), column 1, lines 37-39).

As noted above, the primary advantage of encapsulation claimed by Naoyuki is ease of filling of the capsules, as compared with a prior art system using spacers between substrates, as discussed in detail more fully in the paragraph bridging pages 2 and 3 of the Naoyuki translation. Naoyuki does teach that "coagulation of the electrophoretic particles or adhesion to the electrodes as in devices of the prior art are eliminated and stable display operation is possible" (see page 4 of the enclosed translation, second paragraph under "Effects of the Invention"). In other words, Naoyuki teaches that his encapsulation overcomes problems (b) and (c) above, and perhaps (a)(ii), although *a priori* there is no reason why dye should not absorb on to a capsule wall just as readily, and perhaps more readily, than on to an electrode. However, Naoyuki makes no claim that his encapsulated media overcome problems (a)(i), (d) and (e) above, and hence Naoyuki does not remove all the problems which Sheridon (854) lists as reasons why rotating bichromal ball media of the type described in Sheridon (945) and (854) are preferred over electrophoretic media. Hence, a skilled person would not believe it appropriate to substitute the Naoyuki electrophoretic medium for the Sheridon (854) rotating bichromal ball medium in the Sheridon (945) Figure 8 display.

The Examiner's response to applicants' arguments is, it is respectfully submitted, based upon a misunderstanding of the applicable law. The final Office Action states that "As long as 'one' of the problems encountered by Sheridon is solved by Naoyuki, said improvement is sufficient motivation for the modification of Sheridon in view of Naoyuki. It is respectfully submitted that this statement is erroneous and contrary to common sense; a single credible reason why it is unwise to substitute A for B should be sufficient to dissuade a skilled person from substituting A for B. If Sheridon (854) had only set out reasons (d) and (e) above for not using electrophoretic media, Naoyuki's

teaching regarding encapsulation would have been irrelevant, and the skilled worker would still be entirely justified in not using electrophoretic media in view of Sheridon (854)'s teaching. To take a non-technical analogy, if one drives an automobile to a repair shop saying that one is scared to drive the automobile because all four of the wheels may be about to fall off, one is unlikely to be enthusiastic about driving the automobile after a mechanic has assured you that he has repaired *two* of the wheels so that they will not fall off.

In this connection, it should be noted that problem (d), slow switching time, would appear to be especially important in the Sheridon (945) displays, which are intended to allow a user to write notes upon the rotating bichromal member medium in the same way as upon a paper book. As anyone who has ever attempted to use a word processing program on an under-powered computer can attest, it is very difficult to type or write at any speed in a situation where display of what is typed or written is delayed, even by half a second. Hence, the slow response time of electrophoretic media cited by Sheridon (854) is an especially important reason why the skilled person would be taught away from using the Naoyuki electrophoretic medium in the type of display shown in Sheridon (945).

The method claim 17 is patentable over the references for the same reasons as claim 9.

Patentability of claim 10

All the arguments made above regarding claim 9 also apply to claim 10. Furthermore, as already noted, claim 10 is directed to a display according to claim 9 wherein *the substrate* comprises a clear conductive coating. With respect, none of these passages cited in the rejection of this claim describe a clear conductive coating on the substrate. Sheridon (945), column 2, lines 1-6 states that the *host layer* (34 in Figure 3) is light transparent, as indeed it must be if the color changes produced by rotation of the balls 36 are to be visible to an observer of the display. Sheridon (945), column 4, lines

66-68 refers to "an electrically conductive ground plane 54 disposed on the opposite side of the display sheet"; this ground plane 54 is certainly a conductive coating on the substrate, but there is no suggestion in Sheridon (945) or (854) that such a conductive coating be clear. Indeed, it is not apparent why anyone would take the trouble to provide a clear substrate electrode in a Sheridon (945) display, since such an electrode would not be visible to an observer, being completely obscured by the opaque black and white balls 36 which lie between the observer and the substrate. In contrast, it is logical to provide certain embodiments of the present invention with such a clear conductive coating on the substrate, since (as illustrated for example in Figures 2A-2D of the present application), the electrophoretic media used in the present invention can operate in a "shutter" mode in which one extreme optical state (Figures 2A and 2C) is essentially transparent, while the other extreme optical state is essentially opaque, and viewing of a filter or reflector 60 positioned on the opposed side of the display from an observer requires that the electrode on the substrate be light transmissive. (No analogous shutter mode is possible in the Sheridon rotating bichromal ball medium. Shutter mode depends on the ability of the electrophoretic particles to translate laterally within the capsules, thus allowing most of the capsule cross-section to be free from the particles. Since the Sheridon rotating balls do not translate at all, only rotate, they cannot translate laterally as required for shutter mode operation.) Furthermore, as noted at page 27, line 2, the display 304 shown in Figure 16 may be viewed from either side, which requires that any conductive layer be light transmissive.

Patentability of claims 21 and 22

All the arguments made above regarding claims 9 and 17 respectively also apply to claims 21 and 22. Furthermore, none of the applied references describe the type of electrophoretic medium mentioned in claims 21 and 22. Naoyuki specifically requires that his media include a capsule wall surrounding each capsule. Furthermore, the Examiner has not shown any evidence that the type of medium recited in claims 21 and

22 was known priority to the filing of the parent of the present application. With respect, the arguments in the final Office Action regarding small displays with only a single electrophoretic cavity are irrelevant to the present claims since all claims specify that a plurality of cavities are present in the electrophoretic display medium.

For all of the foregoing reasons, the rejections of the claims on appeal should be reversed and the application allowed.

Respectfully submitted
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CLAIMS APPENDIX

Claims on Appeal

9. An electrostatically addressable display, comprising:

(a) a substrate;

(b) an encapsulated electrophoretic display medium disposed adjacent ~~to~~ said substrate, said electrophoretic display medium comprising a plurality of cavities dispersed in a polymeric matrix, wherein at least one of aid plurality of cavities contains an electrophoretic contrast media phase that includes at least one particle and a suspending fluid; and

(c) a movable electrode,

wherein application of electrostatic charge by said movable electrode to said electrophoretic display medium modulates an optical property of said electrophoretic display medium.

10. The display of claim 9, wherein said substrate further comprises a clear conductive coating.

11. The display of claim 10, wherein said clear conductive coating comprises an ITO-coated polyester.

12. The display of claim 10, wherein the clear conductive coating is connected to ground potential.

13. The display of claim 10, further comprising a dielectric sheet disposed adjacent said electrophoretic display medium.

14. The display of claim 13, wherein said dielectric sheet further comprises a coating having low conductivity.

15. The display of claim 9, wherein said substrate further comprises an opaque conductive coating.

16. The display of claim 9, wherein said movable electrode comprises a stylus.

17. A method of addressing an electrostatically addressable display, comprising:

providing an electrostatically addressable display, comprising:

a substrate,

an electrophoretic display medium disposed adjacent ~~to~~ said substrate, said electrophoretic display medium comprising a plurality of cavities dispersed in a polymeric matrix, wherein at least one of said plurality of cavities contains an electrophoretic contrast media phase that includes at least one particle and a suspending fluid, and

a movable electrode; and

applying an electrostatic charge from said movable electrode to said electrophoretic display medium to modulate an optical property of said electrophoretic display medium.

18. The method of claim 17, further comprising the step of scanning said movable electrode over said electrophoretic display medium.

19. The method of claim 18, wherein the step of scanning said movable electrode over said electrophoretic display medium is performed substantially contemporaneously with the step of applying an electrostatic charge from said movable electrode to said electrophoretic display medium.

20. The method of claim 17, wherein the step of scanning said movable electrode over said electrophoretic display medium and the step of applying an electrostatic charge from said movable electrode to said electrophoretic display medium are performed sequentially.

21. The display of claim 9, wherein no capsule membrane is present between said electrophoretic contrast media phase and said polymeric matrix.

22. The method of claim 17, wherein no capsule membrane is present between said electrophoretic contrast media phase and said polymeric matrix.

EVIDENCE APPENDIX

[None]

RELATED PROCEEDINGS APPENDIX

[None]